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How Pesticide Additives Alter Feeding Behavior and Viral Infections in Honey Bees

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Introduction

Honey bees are vital to agriculture; the decline of honey bee populations in Utah and worldwide is concerning. Several factors can reduce honey bee health and when they interact can increase in magnitude (Fig. 1). We are investigating the interactions of a pesticide ingredient, organosilicone surfactant (OSS), and viral pathogens.

Goals

- Determine if OSS exposure alters honey bee feeding behavior.
- Determine if OSS synergizes with and increases the negative impact of viruses on honey bees.

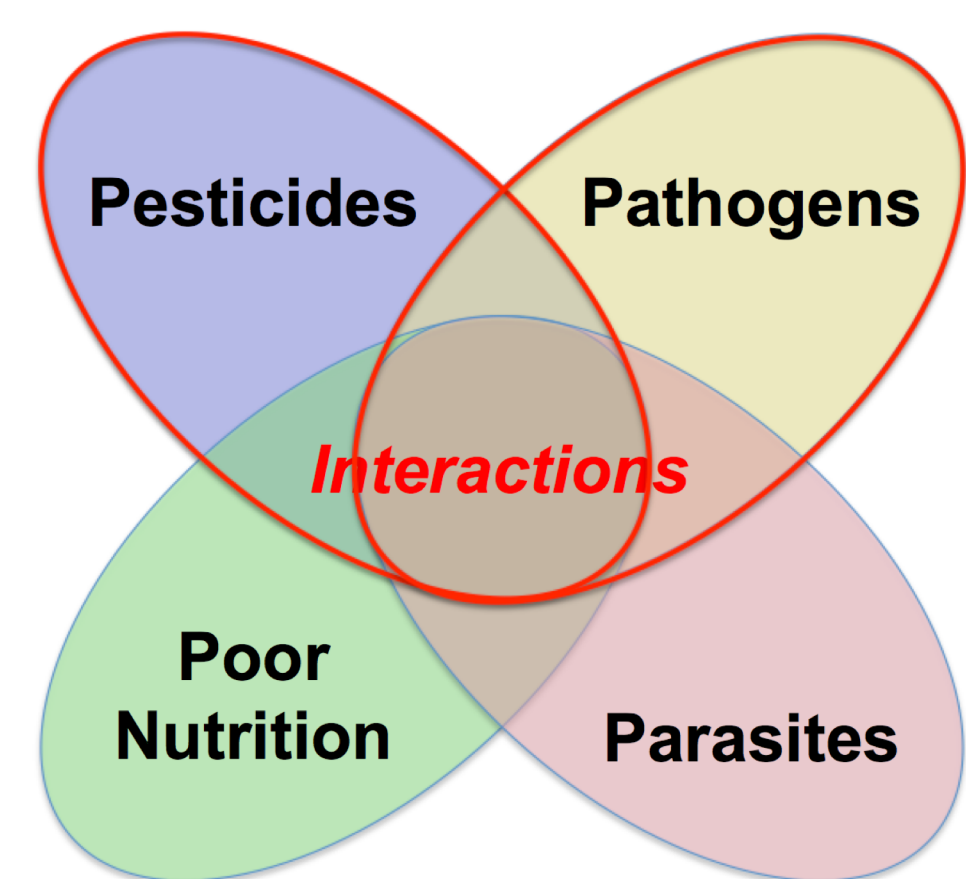


Fig. 1 The interactions of many environmental factors increase the severity of effect on honey bee health.

Feeding Behavior

- We analyzed locally collected adult honey bees. (Fig. 4)
- 36 cohorts of 10 bees were given one of 6 treatments (6 reps/treatment).
- Feeding data was collected for 7 days. (Fig. 2)

Treatment	Ingredients
Control	N/A
OSS Low	OSS (40ppb)
OSS Medium	OSS (1ppm)
OSS High	OSS (10ppm)
Fungicide & Pesticide	Tilt (150 ppb), Altacor (3ppm)
All (Fungicide, Pesticide & OSS Medium)	Tilt (150ppb), Altacor (3ppm) & OSS (1ppm)

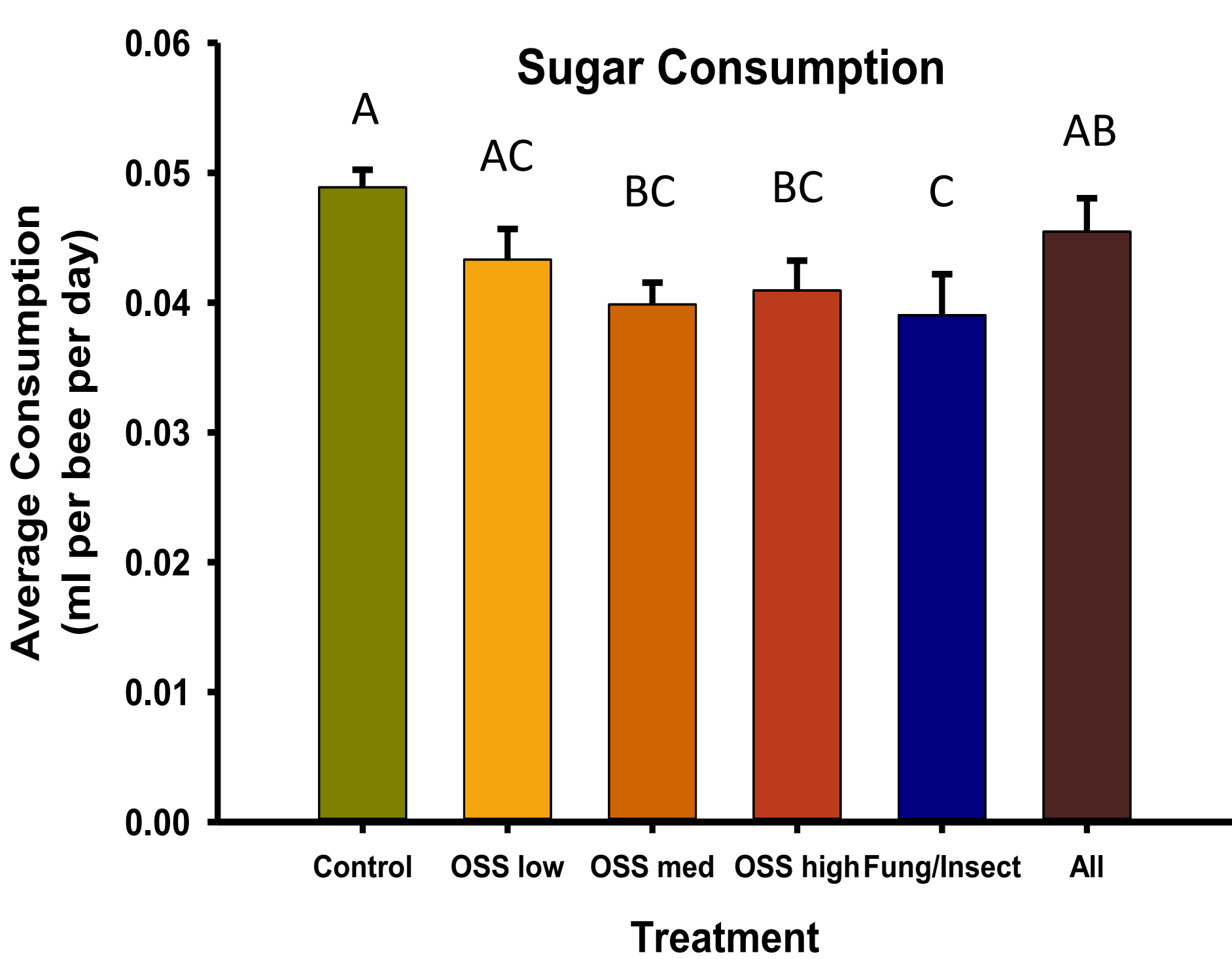


Fig. 2 Bees exposed to moderate and high OSS concentrations showed significantly less feeding than control bees. Significant differences are indicated by lettering above the bars; treatments that do not share a letter are significantly different.

Viral Detection

- We extracted RNA from bees (Fig. 4) and converted it into DNA.
- Viruses were detected via PCR (polymerase chain reaction) and subsequent gel electrophoresis. (Fig. 3)

Viruses screened for:

- Deformed Wing Virus*
- Black Queen Cell Virus*
- Israeli Acute Paralysis Virus
- Sacbrood Virus*
- Kashmir Bee Virus
- Chronic Bee Paralysis Virus
- Lake Sinai Virus

*Detected in all treatments.

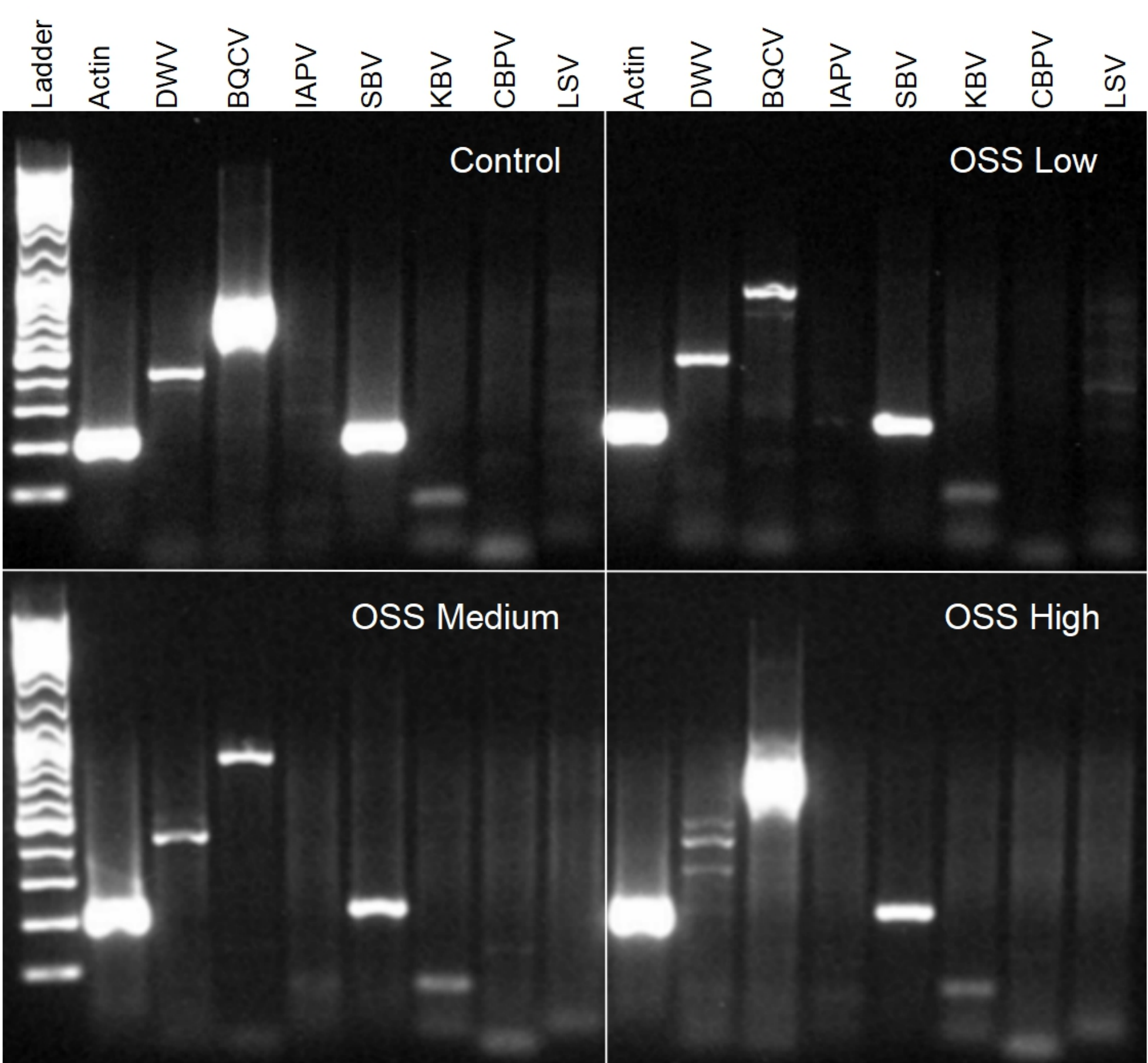


Fig. 3 Gel electrophoresis: DNA shows as a bright band. Similar banding patterns indicate similar viral presence across treatments.



Fig. 4 Analysis was conducted with adult honey bees over 7 days. Treatments were delivered via a sugar water solution in a syringe. In addition to feeding data, genetic information was collected to detect viruses.

Conclusions

- There is evidence that OSS exposure decreases honey bee feeding. However, this effect was not seen with the “All” treatment.
- Preliminary virus detection yielded no observed differences in viral presence between treatments. Future research will examine the precise quantity of viral activity between treatments.
- Future findings will illustrate the impacts of OSS on honey bee health and the potential need to regulate their usage as mixtures in pesticide applications.

